Interaction of Model Lipid Vesicles with Alveolar Macrophages

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Macrophages are a type of white blood cells that play key roles in host defense by recognizing and engulfing foreign and apoptotic bodies. To accomplish this task, they rely on complex molecular interactions involving both lipids and proteins. Previous studies have shown that surface exposure of phosphatidylserine by apoptotic cells is required for their successful clearance, suggesting specific lipid-protein interactions at least for the initiation of phagocytosis of apoptotic cells. However, macrophages can engulf foreign and apoptotic bodies that substantially vary in size suggesting that non-specific interactions over a range of length scales may be relevant. The purpose of our study is to investigate the correlation between physical properties of lipid bilayers and their engulfment by macrophages. We modify bilayer properties systematically as a function of phospholipid headgroup composition and by addition of ceramide and cholesterol. We use a combination of scattering and spectroscopic methods to quantify lipid interactions and flow cytometry to measure engulfment rates. This study can help distinguish between the role of lipids and proteins in clearance of apoptotic and foreign particles.

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